REMARKS

In view of the following remarks, the Examiner is respectfully requested to withdraw the rejections and allow Claims 48-50, 52, 58-68, 96, 99-107 and 110-113, the only claims pending and currently under Examination in this application.

Claims 48, 66, and 67 have been amended to incorporate the limitations of previously pending Claims 97 and 98. Similarly, Claim 104 has been amended to incorporate the limitations of previously pending Claims 108 and 109. Claims 97, 98, 108 and 109 have been correspondingly canceled and certain dependent claims have been amended to reflect the cancellation of these claims. As no new matter has been added by way of these amendments, entry thereof by the Examiner is respectfully requested.

The Examiner is thanked for the personal interview held on December 16, 2008 with the undersigned and Mark Zdeblick. During the interview, the above amendments were proposed and reasons were provided to the Examiner as to why it would not have been obvious to include an analog-to-digital converter in Hrdlicka's leads. The Examiner tentatively agreed that the amendments overcome the rejections, and indicated that an updated search would be required.

Claim Rejections - 35 U.S.C. § 102

Claims 48, 49, 52, 58-62, 96, 97, 101-108 and 112-113 have been rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Hrdlicka et al. (U.S. 6,038,480). Following entry of the above amendment, all of the claims include the limitation of Claim 98, which claim was not included in this rejection. As such, this rejection may be withdrawn.

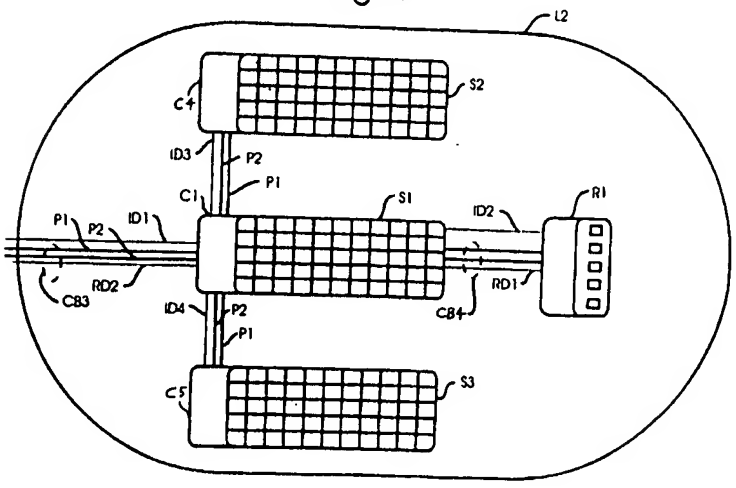
Claims 48, 49, 52, 58-62, 66-68, 96, 97, 101-102, 104-107and 112 have been rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Schallhorn et al. (U.S. 6,473,653). Following entry of the above amendment, all of the claims include the limitation of Claim 98, which claim was not included in this rejection. As such, this rejection may be withdrawn.

Claim Rejections - 35 U.S.C. § 103

Claims 50, 63, 98-100 and 109-11 have been rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Hrdlicka.

As reviewed above, all of the claims now require the elements of previously pending Claims 97 and 98, such that each effector includes a chip that comprises an analog-to-digital converter. In making this rejection, the Examiner points to FIG. 4, asserting that C1 and R1 correspond to the at least two effectors as claimed. FIG. 4 is reproduced below:

Fig. 4



The Examiner further asserts that "C2 filters or otherwise processes the signals (column 4, lines 35+). The Examiner notes that in today's age, most processing is done digitally. Hence, it would have been obvious to include an a/d converter in the chip."

At Col. 3, C1 is described as:

> Referring to FIG. 1, each electrode in array AS1 and AS2 is coupled to controller C1 and/or C2 via conductor wires. A signal is sent to controller C1 and/or C2 along conductor ID1 which identifies the electrodes to be activated. Controllers C1 and C2 act as switching gates coupling power lines P1 and P2 to the activated electrodes in array AS1 and AS2. Some activated electrodes may become cathodes (−) and other electrodes may become anodes (+). The plus signs and minus signs in FIG. 1 indicate electrodes which have been activated as anodes (+) and cathodes (−), respectively. Electrodes not chosen to be activated will be open circuit or will have a high impedance. The arrangement of anodes or cathodes on assembly S1 can be chosen by the patient or through investigation by clinicians to maximize the desired effects of stimulation, e.g., maximize pain relief, minimize spasticity, stop seizures, cause contraction of muscles, etc., and also to minimize undesirable side effects.
>
> Still referring to FIG. 1, power conductors P1 and P2 carry the stimulation current necessary in order to stimulate the electrically excitable tissue adjacent lead L1. For monopolar stimulation, a single one of conductors P1 and P2 would suffice; but for bipolar stimulation, two power conductors (single channel), such as P1 and P2 are needed. For dual channel applications, three or four power conductors may be used. Fewer wires may suffice if the power signal is time division multiplexed.

From the above description and remainder of the specification, one of ordinary skill in the art would understand C1 to be configured digitally such that it

receives digital configuration signals from the data source via ID1. Since C1 is a stimulation electrode array, there is no conversion of analog signals to digital. Since there is no conversion of analog signals to digital, there would be no purpose for an analog-to-digital converter to be present in C1.

Accordingly, one of ordinary skill in the art in view of Hrdlicka would have no motivation to modify C1 to include an analog-to-digital converter, because including an analog-to-digital converter in C1 would serve no purpose.

Furthermore, one of ordinary skill in the art in view of Hrdlicka would have no motivation to modify R1 to include an analog-to-digital converter. One of ordinary skill in the art would read Hrdlicka as disclosing an analog buffer in R1 which takes a signal from a high-impedance electrode and transmits a low-impedance analog signal up the lead. The transmitted signal is then filtered and sampled off-lead in an implantable pulse generator to which the lead is connected.

For sampling electro-physiologic signals whose bandwidth is typically less than a few hundred Hertz (the disclosed purpose of R1), it is known to those of ordinary skill in the art that one typically filters the signal, eliminating higher frequency signals before they are sampled by an analog-to-digital converter, where the analog-to-digital converter is present in an implantable pulse generator. Since the cutoff frequency is so low, the filtering components are relatively large: microfarads and mega-ohm components are typically used in an implantable pulse generator. Since one of ordinary skill in the art would know that the total capacitance on R1 would be about 1 nF, it would be a struggle to find a way to put appropriate components on R1, and they would then have to be used everywhere such a signal is so converted. As such, one would not modify R1 to include an analog-to-digital converter. Instead, if an analog-to-digital converter were employed, it would be employed at an off-lead location, such as in an implantable pulse generator to which the lead is connected.

Furthermore, one of ordinary skill in the art would not modify R1 to include an analog-to-digital converter because such a modification could introduce an unacceptable amount of noise into the signal. Just a single analog-to-digital converter would require a much higher bandwidth to be conducted through the lead. One of ordinary skill in the art would know that an analog-to-digital converter typically samples at least 2x or 4x the highest frequency of interest. So, one of ordinary skill in the art would likely sample at 1200 samples per second. With a 12 bit analog-to-digital converter, that would imply a total of 14400 bits per second per analog-to-digital converter, which could introduce an unacceptable level of noise into the signal. If multiple analog-to-digital converters were transmitting at the same time, one of ordinary skill in the art would know that the problem could be even worse.

Accordingly, one of ordinary skill in the art in view of Hrdlicka would have no motivation to modify R1 to include an analog-to-digital converter, because including an analog-to-digital converter in R1 would potentially introduce an unacceptable level of noise into the signal.

Furthermore, with respect to neurostimulation paddle leads such as depicted in FIG. 4, one of ordinary skill in the art always has the goals of minimizing size of the lead, minimizing cost of the lead and reducing power consumption by the lead. One or ordinary skill in the art would know that high-quality (in terms of linearity, precision, sampling rate and number of bits) analog-to-digital converters require significant amounts of space and power. One or ordinary skill in the art would also understand that in leads such as depicted in FIG. 4, space is at a premium on components such as R1 and C1, as there is barely enough room for the most basic switch functions. Including an analog-to-digital converter on the lead would require additional space, because it is an additional element that would have to be incorporated into the lead. Furthermore, including an analog-to-digital converter on the lead would increase the cost of the lead, as compared to leads that do not

include an analog-to-digital converter. In addition, including an analog to digital converter in the lead would result in the lead using additional power. Because including an analog-to digital converter in the lead would result in an undesirable increase in size, cost and power consumption of the lead with no corresponding benefit, one of ordinary skill in the art would in fact be motivated **not** to include an analog-to-digital converter in C1 or R1.

Accordingly, this rejection may be withdrawn.

Claims 50 and 63-64 have been rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Schallhorn. Following entry of the above amendment, all of the claims include the limitation of Claim 98, which claim was not included in this rejection. As such, this rejection may be withdrawn.

Claims 50 and 63-64 have been rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Schallhorn in view of Sackett. Following entry of the above amendment, all of the claims include the limitation of Claim 98, which claim was not included in this rejection. As such, this rejection may be withdrawn.

CONCLUSION

In view of the amendments and remarks above, this application is considered to be in good and proper form for allowance and the Examiner is respectfully requested to pass this application to issuance.

The Commissioner is hereby authorized to charge any underpayment of fees associated with this communication, including any necessary fees for extensions of time, or credit any overpayment to Deposit Account No. 50-0815, order number PRTS-012.

Respectfully submitted,

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Date: December 31, 2008

By: /Bret E. Field, Reg. No. 37,620/
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